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- (*o*) Memorial: Data on the Drainage Canal.
- (*p*) Maps Showing Territory Sewered by the Sanitary District of Chicago.
- (*q*) Miscellaneous reports on sewage disposal by Langdon Pearse, sanitary engineer for the Sanitary District of Chicago.

3. Reports relating to sewage disposal for Cleveland, Ohio:
   - (*a*) Report on Tests at Sewage Testing Station. 1914.
   - (*b*) Reprint from Engineering News on results of activated sludge treatment. 1916.
4. Reports relating to sewage disposal at Providence, R. I.:
   - (*a*) Annual Report of City Engineer, 1918.
   - (*b*) Plans and Photographs of Disposal Plant (with a description of the plant attached).
5. Brief Description of Sewage Disposal Plants at Atlanta, Ga. 1919.
6. Report of Sewage Testing Station at Akron, Ohio. 1912.
7. Report of Passaic Valley Sewerage Commission, 1916.
8. Report on Sewage Disposal and the Sewage Experiment Station, Gloversville, N. Y. 1908.
9. Report on Sewage Disposal System of Rochester, N. Y. 1913.
10. Reports relating to sewage disposal at Columbus, Ohio:
    - (*a*) Annual Report, 1913.
    - (*b*) Annual Report, 1914.
    - (*c*) Annual Report, 1915.
    - (*d*) Annual Report, 1916.
    - (*e*) Annual Report, 1917.
    - (*f*) Annual Report, 1918.
11. Reports relating to sewage disposal at Milwaukee, Wis.

RURAL PLUMBING.[1]

By Geo. C. Whipple, Professor of Sanitary Engineering in Harvard University, Cambridge, Mass.

The nation-wide movement in favor of better rural living conditions offers opportunities for important extensions of the plumbing business. The movement is found in different stages in different parts of the country, but everywhere it is a progressive movement.

Sanitation is one of its important elements. There are large areas, chiefly in the South, where privies are being constructed for the first time; there are districts where open, surface privies are being replaced by indoor chemical closets, and there are places where indoor water-closets are being installed. The sale of concrete tanks is increasing rapidly, a single factory in a southern city shipping over 2,000 annually.

In its first stages this movement for better sanitation is primarily in the interest of health; in its later stages it is in the interest of both health and comfort.

Plumbers are not interesting themselves as they should in the privy problem, perhaps for the reason that there is no piping and few fixtures to be installed, and they do not see that it has a fundamental relation to their business. Plumbers are naturally called upon to install water-closets in country houses, where these are demanded, but even then they do not give sufficient attention to the most important part of the problem, namely, that of disposal, for the reason that they have never studied it.

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[1] This article originally appeared in The Plumbers' Trade Journal, Steam and Hot Water Fitters' Review, New York, issue of Oct. 25, 1919, and is reprinted here by permission.

In cities the sewer is usually at hand, the plumber looks after the inside work, the drain layer makes the sewer connections, and the city sewer department takes up the burden of final disposal, the house owner being relieved of this responsibility.

When the plumber transfers his work to the country he is apt to follow his city-bred methods. The sewage is led to a cesspool or perhaps to some specially devised tank, leaving the burden of looking after the ultimate disposal of the accumulated filth on the house owner.

It is true that nature does wonders in destroying offensive organic matter, but for the best results the forces of nature need to be guided and utilized to their best advantage. The plumber is not helping to solve this problem, but is leaving it to health officials who do not always have the requisite understanding of the mechanical aspects of the problem. If the plumber does not take a hand in solving this problem, methods of disposal are likely to be devised which do not require plumbing.

The Sewage Disposal Problems.

The plumber does not realize that when he installs rural water-closets without giving adequate attention to the final disposal of the sewage he is catering to comfort but is not safeguarding health. He is very apt to begin his design at the wrong end, to consider fixtures first, arrange the pipes so as to bring all wastes together, and, lastly, to think of disposal. The rural plumber of the future will turn this around and think first of disposal and lastly of fixtures and pipes, considering the problem as a united whole. When something more than a cesspool is planned for a single house it is customary to copy the methods used by municipalities and build these on a small scale. This is illogical and often leads to bad results.

City sewage works require constant attention, and no rural house owner wants to take that burden; he wants to be relieved of it. No system will operate without some attention—advertising circulars to the contrary—but the less work required of the house owner the better he will like it. The treatment of grease will illustrate the difference between city and rural plumbing problems.

Grease is one of the most troublesome substances to get rid of. In cities it necessarily goes to the sewer along with fecal matter and other wastes. Mixed with fecal matter it clogs filters, interferes with septic processes, and increases operating expenses. The large quantities of grease from the kitchens of the Army cantonments was one of the most troublesome aspects of the sewage disposal problems during the war. In the absence of indoor water-closets and sewers it has long been customary to allow sink wastes to be carried out upon the ground near the house and to dispose of fecal matter by the privy method. Even with cesspools this separation has sometimes been made with good results.

But the policy of "everything to the sewer," while it may work well where there is a sewerage system, does not work well where the house sewer terminates on the premises. The reason is that when grease and fecal matter are mixed together the natural processes of destruction do not go on well. If the house sewer terminates in a leaching cesspool and if sink wastes and water-closets both discharge into it the grease clogs up the pores of the ground and prevents percolation, while it also interferes with bacterial action, making necessary the frequent removal of offensive sludge. Cesspools which receive fecal matter only, often run for many years without cleaning, and during this time septic action greatly reduces the amount of sludge. In septic tanks, as well as cesspools, grease interferes with the process.

In imitation of city methods elaborate sewage disposal plants have been built on many a private estate with the house sewer terminating in a septic tank or in somebody's "system," and owners have been told that these systems would need no attention and would create no nuisance. A large proportion of such plants have been dismal failures, causing more trouble than the cesspools which they replaced. This trouble might have been avoided in a great measure by following the simple principle of keeping grease and fecal matter apart.

Fecal matter readily succumbs to decomposition by the anaerobic or septic process. Grease and soaps are best destroyed by exposure to the air. Separate disposal of these wastes means two systems instead of one, but though more pipes may be needed the advantages far outweigh the extra first cost, while the reduced cost of cleaning tends to even up the financial score in the course of a few years.

Practices to be Observed in Country Work.

There is another important principle to follow in designing plumbing systems for rural conditions. As the water has to be disposed of on the premises and as the water supply of the house may be obtained from a well also located on the premises, it is important that fixtures be designed to use as little water as possible. It is well to use a type of closet which will flush with a small amount of water, to use wash-basins of small size, to use shower baths instead of tubs, and to do all that is possible to reduce water consumption.

Again, the whole question of trapping and venting needs modification for the small country house. Houses which are occupied during the summer only need plumbing systems which can be easily drained and made safe against freezing and corrosion during the winter, and so arranged that this work can be done by the owner himself. Getting ready for winter should be regarded as normal operation and not as repairs, and the master plumber should not be expected to be called on for this job.

There are, in fact, many rural plumbing problems which require careful study, problems of water supply, of pumping, of storage, of fixtures, of disposal. They must be solved along the lines of cheapness, simplicity, and ease of operation, but always keeping in mind the protection of the health of the household.

Imitation of city methods or practices will not do. The rural dweller does right to balk at them. And yet the family on the farm and in the small village ought to have as good sanitation as the family in the city. If the plumbers are willing to expand their field and to cooperate with local boards of health, they can do much to restore our decadent rural life with profit to themselves and with benefit to the Nation.

EDITORIAL NOTE.—In connection with the above article on Rural Plumbing, reference is made to the fact that the United States Public Health Service during the past three years has made an investigation relating to the treatment and disposal of sewage from small communities or isolated houses which are provided with community or private systems of water supply and with modern plumbing, but which do not have sewers or other adequate means for the proper disposal of sewage.

This experimental investigation has been carried out by Associate Sanitary Engineer Leslie C. Frank and Assistant Sanitary Engineer C. P. Rhynus, under the supervision of Senior Sanitary Engineer Earle B. Phelps. An extensive report embodying the complete results of the investigation is given in Public Health Bulletin No. 101. A preliminary paper, in which the investigation is briefly described, was published in the Public Health Reports, February 14, 1919.

Where it is necessary only to remove the settling and floating solids the Imhoff tank is recommended. Where it is necessary to produce an oxidized effluent the "preliminary Imhoff tank, lath trickling filter, final Imhoff tank combination" is, in general, most advantageous from the standpoints of area of land and attention required. From the standpoints of fall required and initial cost of construction, the subsurface irrigation method may in some cases offer advantages. It depends wholly upon the drainage and oxidizing capacity of the soil, however, and can not be recommended in general under all kinds of soil conditions. The lath trickling filter, on the other hand, is a device capable of exact reproduction anywhere, and to that extent may be confidently recommended for general use, regardless of soil and other conditions.

Several complete designs, involving preliminary and final Imhoff tanks together with trickling filter, have been worked out for populations of from 6 to 120 people. The degree of purification effected is sufficient for all purposes, except where the discharge is directly into a water supply. In such a case chemical disinfection of the effluent is recommended in addition. The plant will operate without nuisance and, with a monthly inspection and semiannual or annual removal of sludge from the tanks, will operate continuously without further attention.

DEATHS DURING WEEK ENDED JAN. 3, 1920.

From the "Weekly Health Index," Jan. 6, 1920, issued by the Bureau of the Census, Department of Commerce.

Deaths from all causes in certain large cities of the United States during the week ended Jan. 3, 1920, infant mortality (per cent), annual death rates, and comparison with corresponding week of preceding years.

City.	Population July 1, 1918, estimated.	Week ended Jan. 3, 1920.		Average annual death rate per 1,000.[2]	Per cent of deaths under 1 year.	
		Total deaths.	Death rate.[1]		Week ended Jan. 3, 1920.	Previous year or years.[2]
Albany, N. Y	112,565	43	19.9	C 17.6	4.7	C 10.5
Atlanta, Ga	201,732	57	14.7	C 17.3	14.0	C 14.9
Baltimore, Md	[3] 669,981	229	17.8	A 19.5	15.7	A 13.8
Birmingham, Ala	197,670	57	15.0	A 15.8	12.3	A 15.2
Boston, Mass	785,245	253	16.8	A 21.3	15.4	A 14.5
Buffalo, N. Y	473,229	131	14.4	C 15.6	16.8	C 19.7
Cambridge, Mass	111,432	19	8.9	A 10.3	10.5	A 9.3
Chicago, Ill	2,596,681	715	14.4	A 17.8	14.7	A 16.0
Cincinnati, Ohio	418,022	129	16.1	C 19.2	9.3	C 11.7
Columbus, Ohio	225,296	73	16.9	C 20.4	5.5	C 14.8
Dayton, Ohio	130,655	36	14.4	C 20.4	27.8	C 11.8
Denver, Colo	....	75	....	....	14.7	....
Fall River, Mass	128,392	29	11.8	C 13.8	41.4	C 5.9
Grand Rapids, Mich	135,450	29	11.2	C 14.2	20.7	C 10.8
Indianapolis, Ind	290,389	92	16.5	C 17.8	5.4	C 13.1
Jersey City, N. J	318,770	80	13.1	C 14.1	15.0	C 16.3
Kansas City, Mo	313,785	98	16.3	C 18.4	8.2	C 5.4
Los Angeles, Calif	568,495	184	16.9	A 15.1	7.1	A 9.3
Louisville, Ky	242,707	67	14.4	C 16.8	7.5	C 6.4
Lowell, Mass	109,081	31	14.8	A 18.3	19.4	A 16.8
Memphis, Tenn	154,759	73	24.6	C 22.9	6.8	C 8.8
Milwaukee, Wis	453,481	101	11.6	A 13.5	16.8	A 18.8
Minneapolis, Minn	383,442	84	11.4	C 11.3	9.5	C 15.7
Nashville, Tenn	119,215	44	19.2	C 16.6	13.6	C 7.9
Newark, N. J	428,684	116	14.1	C 17.4	12.9	C 13.3
New Haven, Conn	154,865	40	13.5	C 19.5	10.0	C 10.3
New Orleans, La	382,273	138	18.8	A 22.8	13.8	A 13.2
New York, N. Y	5,215,879	1,401	14.0	C 16.8	12.6	C 14.3
Oakland, Calif	214,206	51	12.4	A 13.8	9.8	A 10.7
Omaha, Nebr	180,264	47	13.6	C 11.9	27.7	C 7.3
Philadelphia, Pa	1,761,371	526	15.6	[4] 16.7	16.0	[4] 14.2
Pittsburgh, Pa	593,303	182	16.0	C 22.1	14.3	C 14.7
Portland, Oreg	....	69	....	....	2.9	C 5.1
Providence, R. I	263,613	61	12.1	C 15.6	16.4	C 6.3
Richmond, Va	160,719	48	15.6	C 19.1	6.2	C 10.2
Rochester, N. Y	264,856	65	12.8	C 9.8	10.8	C 12.0
St. Louis, Mo	779,951	210	14.0	C 15.3	10.0	C 8.7
St. Paul, Minn	257,699	48	9.7	C 10.9	12.5	C 18.5
San Francisco, Calif	478,530	151	16.5	C 14.3	7.3	C 6.9
Seattle, Wash	....	71	....	....	9.9	A 11.3
Spokane, Wash	....	14	....	....	64.3	C 5.6
Syracuse, N. Y	161,404	41	13.2	C 15.2	24.4	C 10.6
Toledo, Ohio	262,234	66	13.1	A 13.9	19.7	A 15.2
Washington, D. C	401,681	148	19.2	A 17.3	12.2	A 9.8
Worcester, Mass	173,650	38	11.4	C 19.2	15.8	C 10.9

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[1] Annual rates per 1,000 estimated population.

[2] "A" indicates data for the corresponding week of the years 1913 to 1917, inclusive. "C" indicates data for the corresponding week of the year 1917.

[3] Population estimated as of July 1, 1919.

[4] Data are based on statistics of 1915, 1916, and 1917.

Summary of information received by telegraph from industrial insurance companies for week ended Jan. 3, 1920.

Policies in force	42,319,748
Number of death claims	7,954
Death claims per 1,000 policies in force, annual rate	9.8